

Claims

[c1] 1. An integrated circuit for providing drive signals to a piezo element of a milli-actuator device in a mass data storage device, comprising:
a first circuit for receiving head position control signals and for providing a charging current to a sense capacitor in response thereto;
wherein said first circuit is powered by a voltage supply that is referenced to a substrate potential; and
a second circuit for mirroring a current in said first circuit at a predetermined mirror ratio to provide drive currents to said piezo element.

[c2] 2. The integrated circuit of claim 1 wherein said substrate potential is an analog ground potential.

[c3] 3. The integrated circuit of claim 1 wherein said voltage supply is a voltage supply other than a voltage supply for said piezo element.

[c4] 4. The integrated circuit of claim 1 wherein said predetermined mirror ratio is 10:1.

[c5] 5. The integrated circuit of claim 1 wherein said predetermined mirror ratio is 6.125:1.

[c6] 6. The integrated circuit of claim 1 further comprising:
a first switch connected to selectively disable said first circuit;
a second switch connected to selectively provide a feedback path from said second circuit to an input of said second circuit;
wherein when said first and second switches are selectively operated, said integrated circuit operates in a voltage mode.

[c7] 7. The integrated circuit of claim 1 further comprising servo circuitry integrated therewith.

[c8] 8. A milli-actuator driver for positioning a head of a hard disk drive, comprising:
first integrated circuit means for receiving head position control signals and for

providing a charging current to an external sense capacitor in response thereto; wherein said first integrated circuit means is powered by a voltage supply that is referenced to a substrate potential; and

second integrated circuit means for mirroring a current in said first integrated circuit means at a predetermined mirror ratio to provide drive currents to a piezo element.

[c9] 9. The milli-actuator driver of claim 8 wherein said substrate potential is an analog ground potential.

[c10] 10. The milli-actuator driver of claim 8 wherein said voltage supply is a voltage supply other than a voltage supply for said piezo element.

[c11] 11. The milli-actuator driver of claim 8 wherein said predetermined mirror ratio is 10:1.

[c12] 12. The milli-actuator driver of claim 8 wherein said predetermined mirror ratio is 6.125:1.

[c13] 13. The milli-actuator driver of claim 8 further comprising:
a first switch connected to selectively disable said first integrated circuit means;
a second switch connected to selectively provide a feedback path from said second integrated circuit means to an input of said second integrated circuit means;
wherein when said first and second switches are selectively operated, said integrated circuit operate in a voltage mode.

[c14] 14. The milli-actuator driver of claim 8 further comprising servo circuitry integrated therewith.

[c15] 15. An integrated circuit for providing drive signals to a piezo element of a milli-actuator device in a mass data storage device to position a data head thereof, comprising:
a current mirror;
said current mirror comprising:

a first current mirror portion;
said first current mirror portion being configured to receive head position control signals from a head position sensing circuit;
said first current mirror portion being configured to provide a first current in response to said head position control signals for connection to a capacitor;
said first mirror portion being powered by a voltage supply that is referenced to a substrate potential;
a second current mirror portion;
said second current mirror portion being configured to mirror said first current at a predetermined mirror ratio; and
said second current mirror being configured to provide drive currents for connection to said piezo element.

- [c16] 16. The integrated circuit of claim 15 wherein said substrate potential is an analog ground potential.
- [c17] 17. The integrated circuit of claim 15 wherein said voltage supply is a voltage supply other than a voltage supply for said piezo element.
- [c18] 18. The integrated circuit of claim 15 wherein said predetermined mirror ratio is 10:1.
- [c19] 19. The integrated circuit of claim 15 wherein said predetermined mirror ratio is 6.125:1.
- [c20] 20. The integrated circuit of claim 15 further comprising:
a first switch connected to selectively disable said first current mirror portion
a second switch connected to selectively provide a feedback path from said second current mirror portion to an input of said second current mirror portion
wherein when said first and second switches are selectively operated, said integrated circuit operate in a voltage mode.
- [c21] 21. The integrated circuit of claim 15 further comprising servo circuitry integrated therewith.

[c22] 22. A method for operating a milli-actuator driver for a mass data storage device, comprising:
providing a current mirror having first and second current outputs, wherein said first and second current outputs have a ratio of $1X:nX$;
wherein said first current output is adapted to be connected to a capacitor;
wherein said second current output is adapted to be connected to a piezo element of milli-actuator; of said mass data storage device
providing a supply voltage to at least a first portion of said current mirror that is referenced to a ground voltage.

[c23] 23. The method of claim 22 wherein said ground voltage is a substrate potential.

[c24] 24. The method of claim 22 further comprising configuring said current mirror to have a $1X:nX$ ratio of 1:10.

[c25] 25. The method of claim 22 further comprising configuring said current mirror to have a $1X:nX$ ratio of 1:6.125.

[c26] 26. The method of claim 22 further comprising:
providing a first switch connected to selectively disable said first current output of said current mirror.
providing a second switch connected to selectively provide a feedback path for said second current output of said current mirror.
wherein when said first and second switches are selectively operated, said milli-actuator driver operates in a voltage mode.